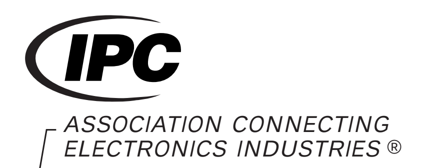


IPC-2512A

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description [ADMIN]

"The data model of this standard shall be in effect until 2001-12." At that time, the committee will consider changes, revision, other actions.

IPC-2512A
November 2000

A standard developed by IPC

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www.ipc.org

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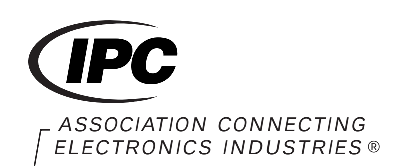
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IPC-2512A



[ADMIN]

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description

A standard developed by the Computerized Data Format Standardization Subcommittee (2-11) of the Data Generation and Transfer Committee (2-10) of the Institute for Interconnecting and Packaging Electronic Circuits.

The GenCAM format is intended to provide CAD-to-CAM, or CAM-to-CAM data transfer rules and parameters related to manufacturing printed boards and printed board assemblies. The requirements of IPC-2511 are a mandatory part of this sectional standard.

This standard is part of the GenCAM 1.5 release.

"The data model of this standard shall be in effect until 2001-12." At that time, the committee will consider changes, revision, other actions.

Users of this standard are encouraged to participate in the development of future revisions.

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Acknowledgment

Any Standard involving a complex technology draws material from a vast number of sources. While the principal members of the IPC Data Generation and Transfer Committee of the IPC Data Transfer Solution DTS Subcommittee are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Data Generation and Transfer Committee

Chairman
Harry Parkinson
Digital Equipment

Data Transfer Solution DTS Subcommittee

Chairman
Harry Parkinson
Digital Equipment

Technical Liaisons of the IPC Board of Directors

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Pensar Corp.

Peter Bigelow
Beaver Brook Circuits Inc.

Special Note of Thanks

Key Individuals — An executive group of personnel from different computer disciplines helped to make this document possible. To them and their dedication, the IPC extends appreciation and gratitude. These individuals are:

Dieter Bergman, IPC

Jerry Brown, eSeeData

Yueh Chang, Northern Telecom

Anthony Cosentino, Lockheed Martin

Dino Ditta, Router Solutions

Allan Fraser, GenRad

Barbara Goldstein, NIST

Doug Helbling, Intel

Michael McCaleb, NIST

Michael McLay, NIST

John Minchella, Celestica

Robert Neal, Agilent

Richard Nedbal, Advanced CAM

Harry Parkinson, Digital Equipment

Michael Purcell, Infinite Graphics

Stan Radzio, OrCAD

Taka Shioya, Solectron

Craig Carlson Stevermer, Infinite Graphics

Eric Swenson, Mitron Corporation

Sasha Wait, Myrus Design

William Williams IV, GenRad

TABLE OF CONTENTS

Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description (ADMIN)

1 SCOPE

This standard is part of the IPC-2510 series of standards. These standards are used to specify a data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, inspection and testing requirements. These formats may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The files are also useful when the manufacturing cycle includes computer-aided processes and numerical control machines.

The GenCAM format requirements are provided in a series of standards focused on printed board manufacturing, assembly, inspection, and testing. This standard series consists of a generic standard (IPC-2511) which contains all the general requirements. There are seven sectionals that are focused on the details necessary to accumulate information in the single GenCAM file, that addresses the needs of the manufacturing disciplines producing a particular product. The sectional standards (IPC-2512 through 2518) paraphrase the important detailed requirements and provide suggested usage and examples for the topic covered by the sectional standard.

The information can be used for both manual and for digital interpretations. The data is defined in either English or International System of Units (SI)1 units.

1.1 Focus

This standard (IPC-2512) provides the information on administrative requirements used for the ordering, request for quote or asking for changes of a particular printed board or printed board assembly. This standard calls out the details defined in the generic standard (IPC-2511) that are required to accomplish these focused tasks.

2 APPLICABLE DOCUMENTS

The following documents contain provisions which, through reference in this text, constitutes provisions of IPC-2512. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties to agreements based on this generic standard are encouraged to investigate the possibility of applying the most recent additions of the documents indicated below.

IPC-T-50		Terms and Definitions for Interconnecting and Packaging Electronic Circuits
IPC-2511	(MANGN)	Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer
IPC-2513	(DRAWG)	Sectional Requirements for Implementation of Drawing Methods for Manufacturing Data Description
IPC-2514	(BDFAB)	Sectional Requirements for Implementation of Printed Board Fabrication Data Description
IPC-2515	(BDTST)	Sectional Requirements for Implementation of Bare Board Product Electrical

1 See *Guide to the Use of the International System of Units (SI)*, NIST Special Publication 811, http://ts.nist.gov/ts/htdocs/210/217/217.htm;

		Testing Data Description
IPC-2516	(BDASM)	Sectional Requirements for Implementation of Assembled Board Product Manufacturing Data Description
IPC-2517	(ASEMT)	Sectional Requirements for Implementation of Assembly In-Circuit Testing Data Description
IPC-2518	(PTLST)	Sectional Requirements for Implementation of Part List Product Data Description
IPC-2519	(MODEL)	Sectional Requirements for Information Model Data Related to the Printed Board and Printed Board Manufacturing Descriptions

3 REQUIREMENTS

The requirements of IPC-2511 are a mandatory part of this standard. The IPC-2511 document describes the generic requirements of the GenCAM format. The format specifies details specifically for information interchange of data related to printed board manufacturing, assembly and test.

GenCAM is comprised of twenty sections as described in the generic GenCAM standard, IPC-2511. The sections are shown in Tables 3-1 and 3-2 of the IPC-2511.

Each section has a specific function or task respectively and is independent of each other. Accordingly, the information interchange for a specific purpose is possible only if the sections required for such a purpose have been prepared.

3.1 Categories and Content

Table 3-1 provides the section names that are appropriate for administration of board fabrication and assembly processes. There are seven unique functions that can be defined by the use of these sections of the GenCAM system.

Table 3-1 indicates the requirements for various sections needed to describe particular processes. The letter **"M"** signifies a mandatory requirement. The letter **"O"** signifies an optional characteristic that may or may not be pertinent to the particular section. A dash signifies an extraneous section (unnecessary); Compliance Test Modules (CTMs) will not reject file summaries if extraneous sections are present.

Table 3-1 signifies two requirement conditions separated by a "/". The first representation of requirements is intended to convey those GenCAM sections that **shall** be available as the initial input to the administrative processes. The second instance of a requirement is to signify those data that **shall** be available once the processing descriptions have been completed. The data may be added by the user, fabricator, assembly, or inspection/testing functions.

Table 3-1 Administrative Data Functions

File Identifiers	Board Fabrication	Board Test	Board Build Tools	Assembly	Assembly Test	Assembly Build Tools	Drawings
HEADERS	M/M	M/M	M/M	M/M	M/M	M/M	M/M
ADMINISTRATION	M/M	M/M	M/M	M/M	M/M	M/M	M/M
PRIMITIVES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
ARTWORKS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
LAYERS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
PADSTACKS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
PATTERNS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
PACKAGES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
FAMILIES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
DEVICES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
MECHANICALS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
COMPONENTS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
ROUTES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
POWER	O/O	O/O	O/O	O/O	O/O	O/O	O/O
TESTCONNECTS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
BOARDS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
PANELS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
FIXTURES	O/O	O/O	O/O	O/O	O/O	O/O	O/O
DRAWINGS	O/O	O/O	O/O	O/O	O/O	O/O	O/O
CHANGES	-/ O*	-/ O*	-/ O*	-/ O*	-/ O*	-/ O*	-/ O*

* The CHANGES section is used independently to alter previously sent files. Included **shall** be a HEADER section (for revision status and identification) and an ADMINISTRATION section to show effectivity

The correlation between the various descriptions identified in this standard is indicated in Figure 3-1. This shows the relationship of personnel, ordering data, and CAD data.

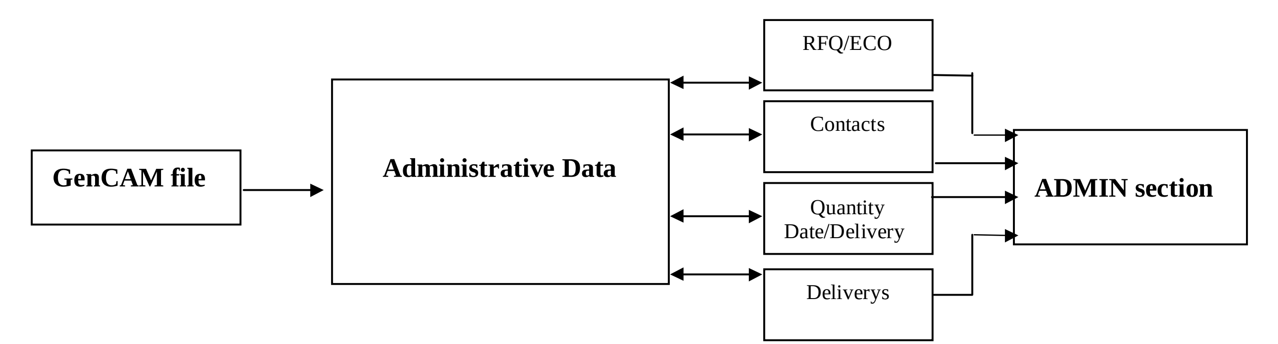


Figure 3-1 Administrative Data Relationships

4 GENERAL RULES

The following details reflect the rules used in GenCAM to meet the requirements for administrative data. These rules are intended to meet the needs of the manufacturer to understand the customer requirements.

Wherever necessary, additional requirements have been detailed to reflect precision. The attributes and rules for GenCAM described in IPC-2511 are required.

Wherever necessary, detailed descriptions or definitions of the entities, attributes or characteristics are described according to the following detailed in Table 4-1 and descriptions.

Table 4-1 Keyword Usage

Need Identifier	Keyword/Section	Keyword Usage
Board Number	HEADER.BOARD.<board_id>	Describes the board being produced; board number is the third parameter.
Unit of Work (Quantity)	Second parameter of the ASSEMBLY, PANEL, BOARD, and FIXTURE statements of the ADMINISTRATION Section	Number of units being produced.
Revision Control	Fourth parameter of the ASSEMBLY, PANEL, BOARD, and FIXTURE statements of the HEADER Section	Describes the current revision of the unit of work.
Purchase Order Number	Second parameter of the TRANSACTION statement of the ADMINISTRATION Section	Describes the purchase order reference number for the order, provided that transaction type is PO.
Parts List	Part of DEVICES and COMPONENTS Sections, see IPC-2518	Describes the details contained within the GenCAM file.
Personnel	PERSON, Identification of personnel in the ADMINISTRATION Section	Describes the individuals involved in the administration of ordering the product through the following: <person_id>, <name>, <enterprise>, <street_addr>, <city>, <state/prov>, <country>,<postal_code>, [<phone>], [<fax>], [<email>], [<url>], [<title>];
Sender Information	SENT.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for individuals who sent the data in the format, <person_id>, which is the first parameter of PERSON.
Receiver Information	RECEIVED.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for individuals who received the data in the format, <person_id>, which is the first parameter of PERSON.
Designer Information	DESIGNER.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for individuals who designed the data in the format, <person_id>, which is the first parameter of PERSON.
Engineer Information	ENGINEER.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for the engineer in the format, <person_id>, which is the first parameter of PERSON.
Buyer Information	BUYER.<person_ref> part of the ADMINISTRATION Section	Describes the person model for the buyer in the format, <person_id>, which is the first parameter of PERSON.
Assembly Number	ASSEMBLY.<assembly_number>, part of the HEADER Section	Describes the assembly being produced; the assembly number is the third parameter.
Panel Number	PANEL.<panel_number>, part of the HEADER Section	Describes the panel being produced; the panel number is the third parameter.
Customer Service	CUSTOMERSERVICE.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for the individual who is responsible for servicing the account, in the format <person_id>, which is the first parameter of PERSON.
Accept	ACCEPT.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for the individual who receives the product and accepts it, in the format, <person_id>, which is the first parameter of PERSON.
Payee	BILLTO.<person_ref>, part of the ADMINISTRATION Section	Describes the person model for the individual who will pay for the product in the format, <person_id>, which is the first parameter of PERSON.
Quantity	Second parameter of the ASSEMBLY, BOARD, PANEL and FIXTURE statements of the ADMINISTRATION Section	Total order <quantity>, as a positive integer, of the item being purchased.
Delivery	The SCHEDULE.<delivery_date> statement <product_ref>, <delivery_ date>, and<count> parameters in the ADMINISTRATION Section	Number of units that need to be delivered within a specific time. Schedule includes total shipments in time periods related to number of product per end date until complete units are shipped.
Comments	COMMENT, part of the ADMINISTRATION Section	ASCII character string <comment>

4.1 ADMINISTRATION

ADMINISTRATION includes the administrative data to control work generated from CAD files. A basic data model exists as a part of ADMINISTRATION data; this is the person model. The person model has the name, company, location, telephone number and associated data to provide easier communication when transmitting data files between a designer/engineer and a manufacturer. The person model can be used in any of the motions required and permits the multi-use of the same person performing similar administrative functions.

The person model is applied to the following keywords: SENT, OWNER, RECEIVED, DESIGNER, ENGINEER, BUYER, CUSTOMERSERVICE, ACCEPT, and BILLTO. The only information needed is the <person_id> that has been established for the person. Thus, if only one person has been identified for all of the functions, the ADMINISTRATION section would only convey one person, and that person's identification would be listed behind each of the keywords.

5 MODELING

The data files of GenCAM may be mapped to the information models. Information models are developed to ensure that complete mapping is capable between the information provided within the GenCAM characteristics. The correlation is provided in the activity models shown in IPC-2519.

All data activities are based on activity models as defined in IPC-2519. The activity models covered by CAD and CAM include the engineering, design, administrative, and fabrication and assembly characteristics. Each of these sections are intended to be detailed into various levels of activity much like layers of information needed to perform a particular manufacturing process.

Figure 5-1 shows the activity needed to develop administrative data.

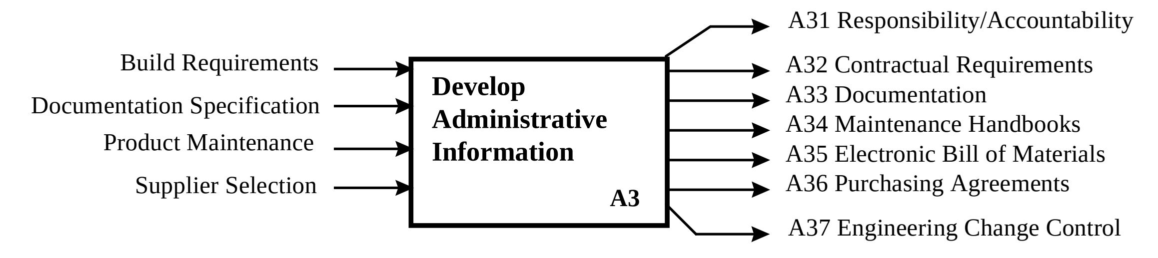


Figure 5-1 Administrative Information Activity

5.1 Information Models

Information models are also helpful in understanding the requirements of the ADMINISTRATION section. Attribute information is correlated to the parameters of GenCAM as well as to the activity models used to describe administrative data.

EXPRESS is an international information modeling format supported by ISO 10303-11. The graphic representation of EXPRESS is known as EXPRESS-G. Appendix A provides an explanation of the different EXPRESS-G requirements. Figures 5-2 through 5-5 show the EXPRESS-G version of the GenCAM HEADER and ADMINISTRATION sections. See www.gencam.org for the complete EXPRESS-G model.

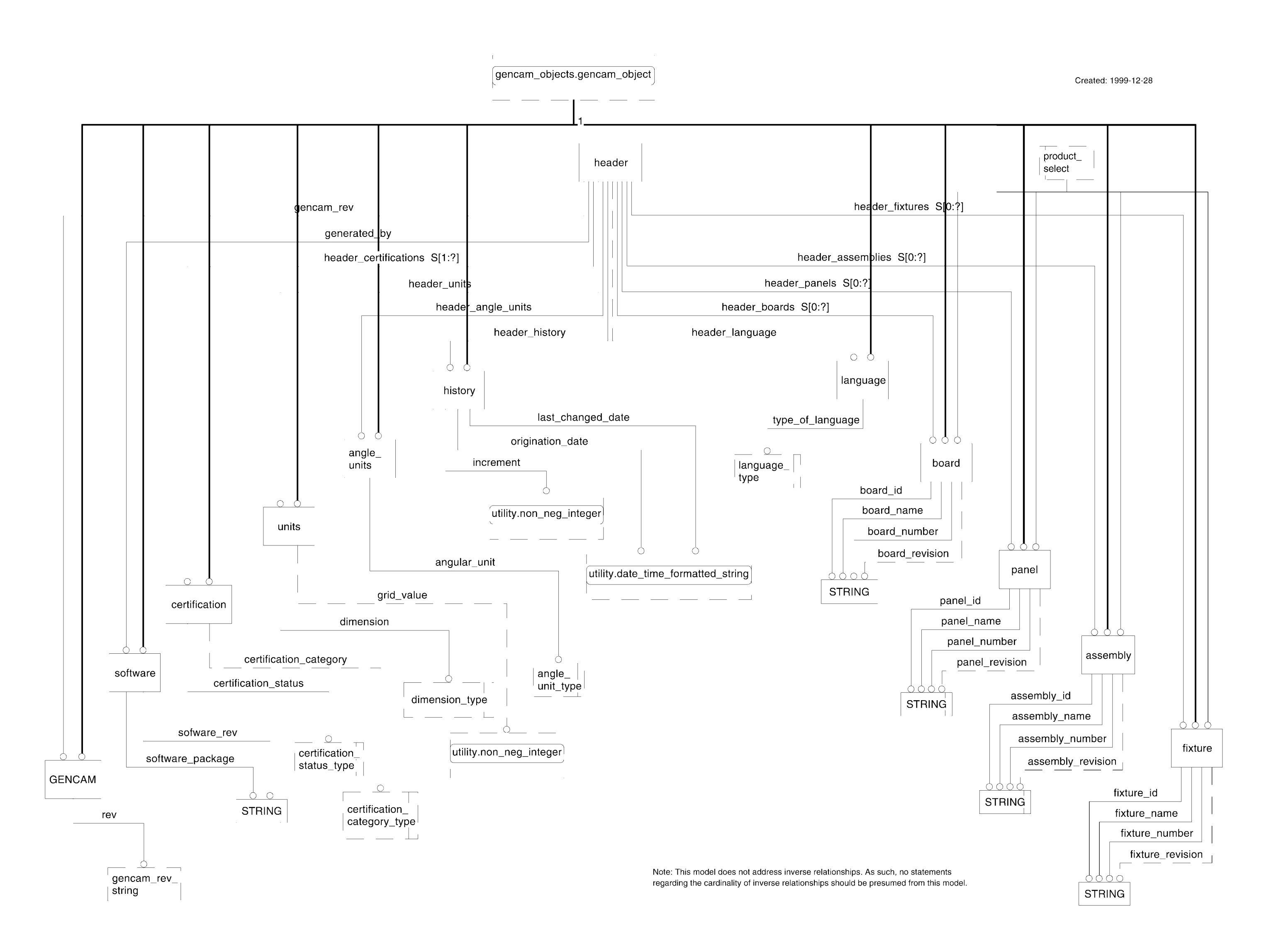


Figure 5-2 EXPRESS-G for HEADER

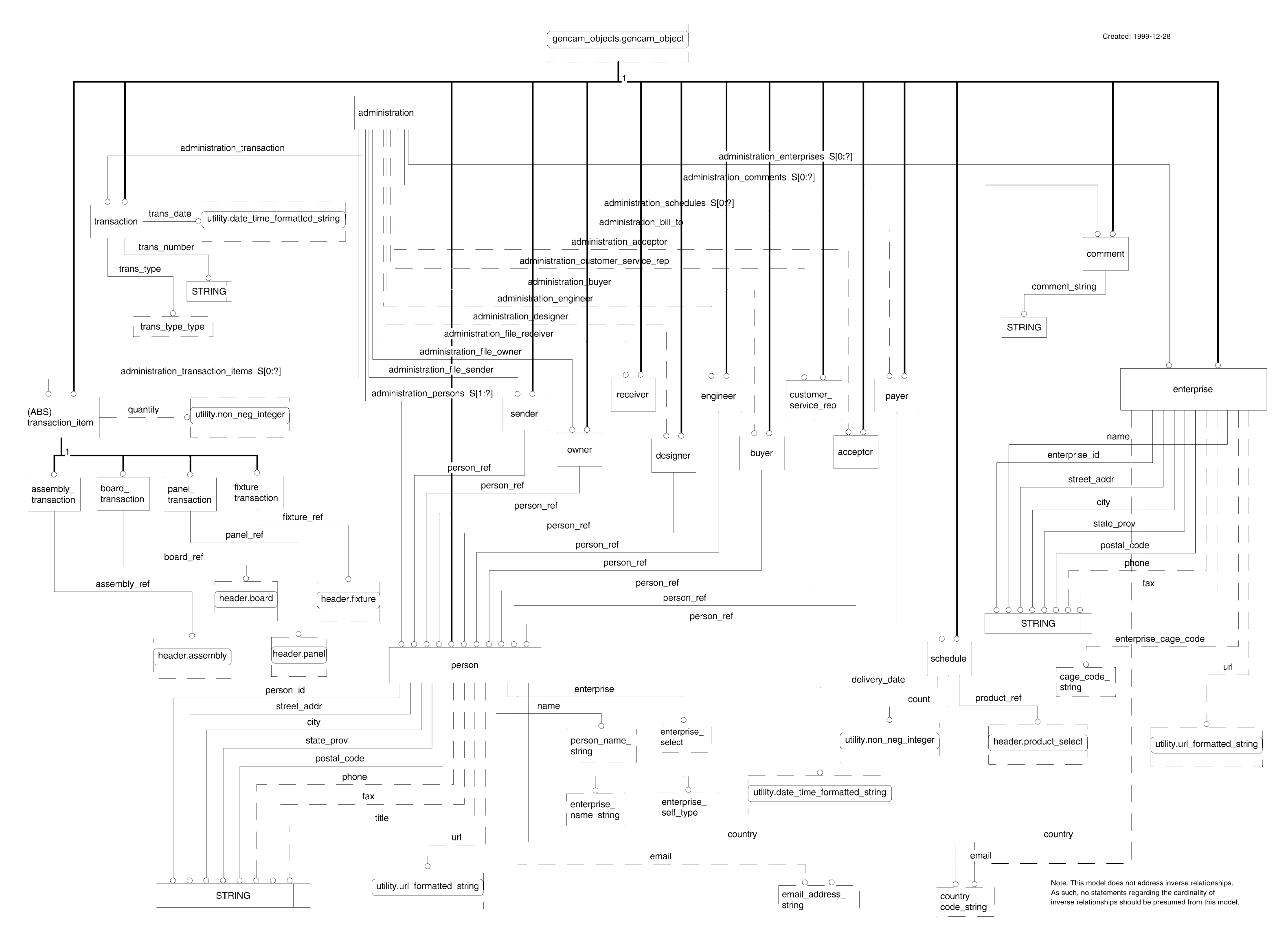


Figure 5-3 EXPRESS-G for ADMINISTRATION

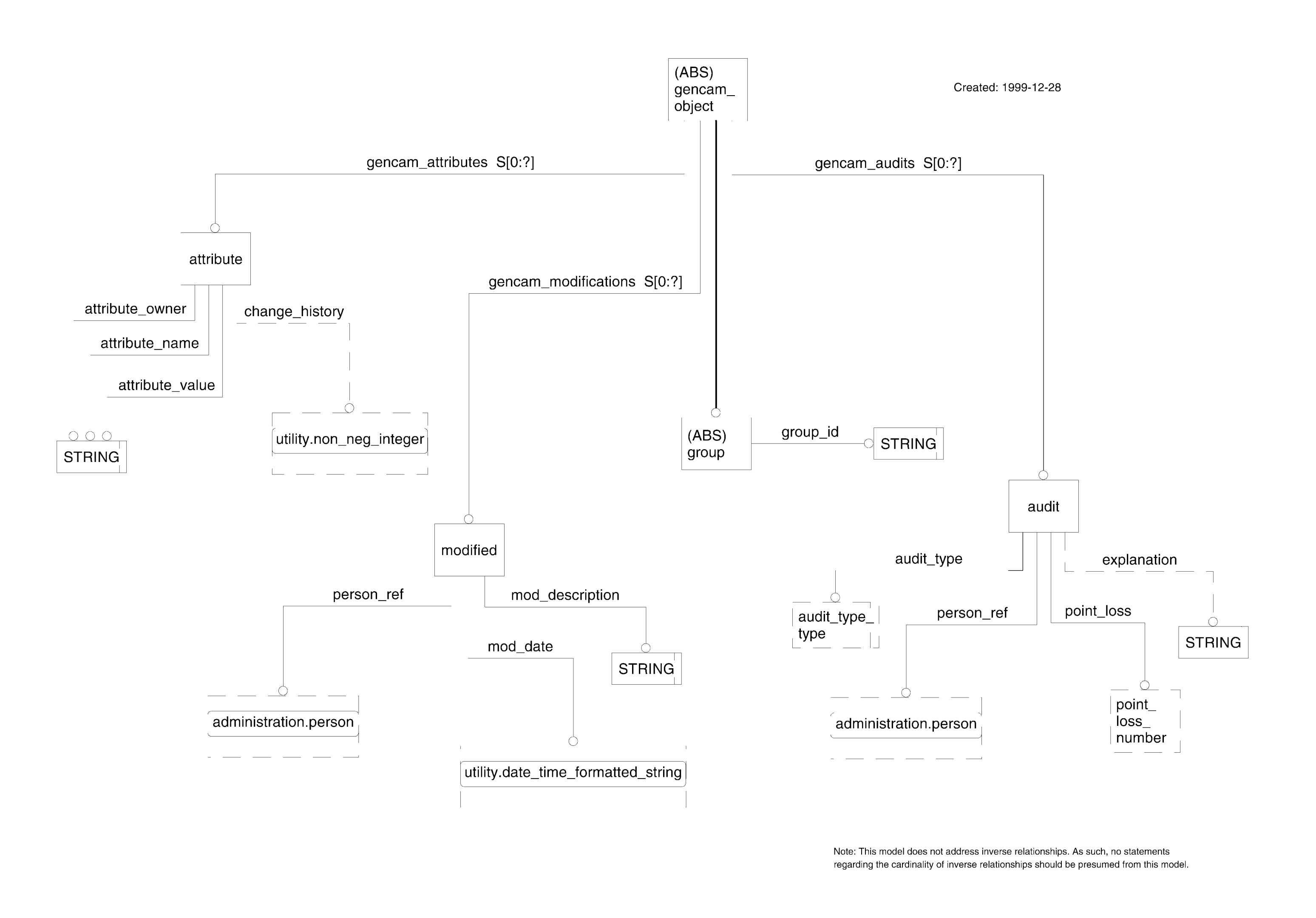


Figure 5-4 EXPRESS-G for ATTRIBUTES

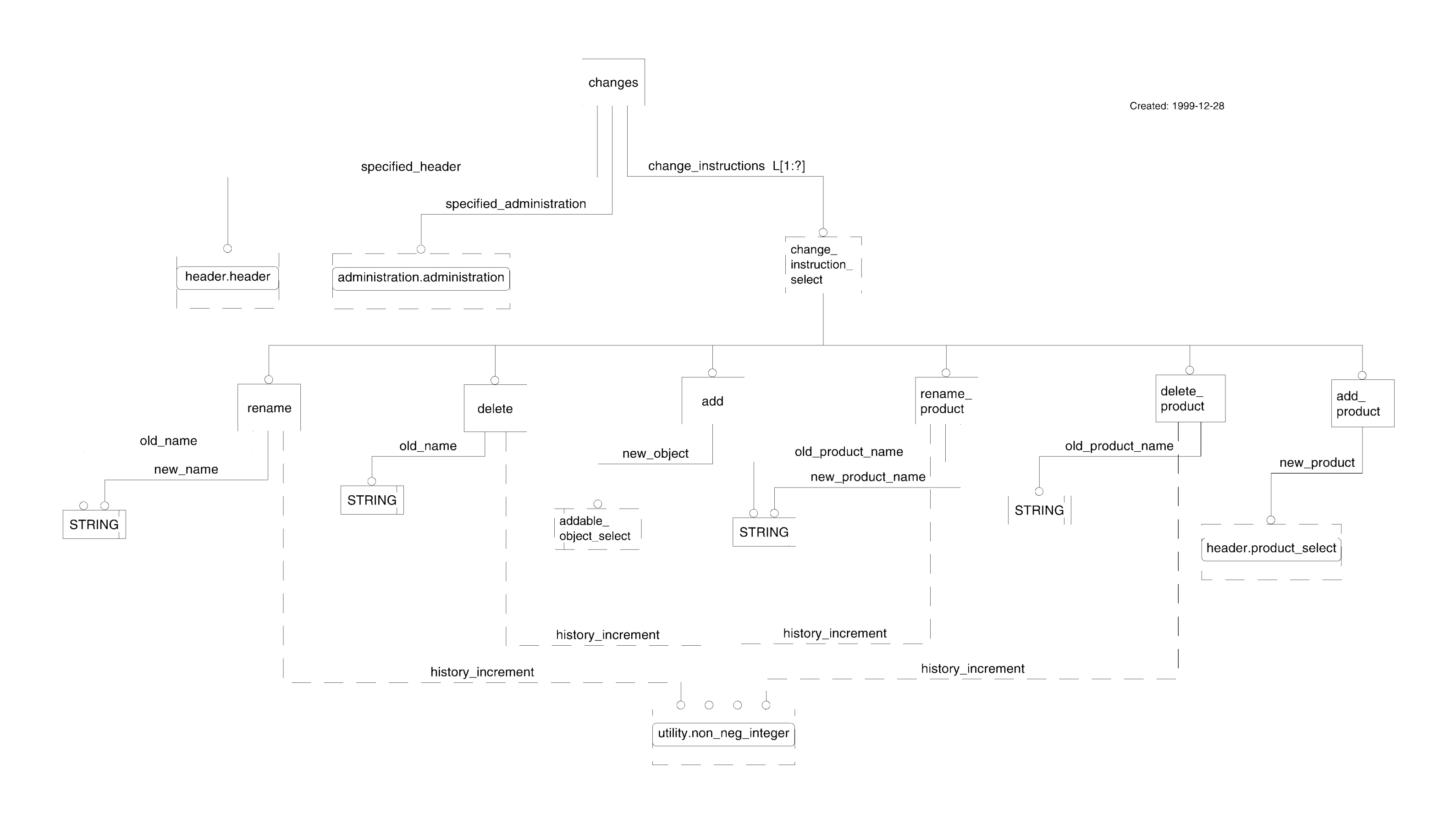


Figure 5-5 EXPRESS-G for CHANGES

6 REPORT GENERATORS

Data can be extracted from GenCAM files to produce various formats that are commonly used in the electronics industry. The types of reformatting can be used for electronic data transfer to tools or to facilitate inspection and human interpretation of text and/or graphic rendering. Note that no extraction tools are included in the IPC-2510 standard. Their creation is left to the industry as the need arises.

An example report is very similar to an index card file and is established as shown in Table 7-1.

Table 6-1 Sample Report - Customer Directory

Name	Company	Address	City,State, Postal Code, Country	Phone	Fax	Email	Title
Bill Smith	ABC, Inc.	110 Cider Lane	Fuller Mills Ohio, 07032 USA	415-632-6760	415-632-1020	bsmith@abc.com	Engineer
Ralph Jones	XYZ Corp.	2213 1st Street	Tempe AZ 90320	201-354-7300	201-755-2010	jonesr@xyz.com	Designer

7 REFERENCE INFORMATION

The following sections define reference documents that are useful in clarifying the products or process of the industry or provide additional insight into the subject of data modeling or released information models.

7.1 IPC (1)

IPC-2221 Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies
IPC-D-300 Printed Board Dimensions and Tolerances
IPC-D-310 Guidelines for Artwork Generation and Measurement Techniques for Printed Circuits
IPC-D-325 Documentation Requirements for Printed Boards, Assemblies and Support Drawings

7.2 American National Standards Institute (2)

ANSI X3/TR-1-77 American National Dictionary for Information Processing
ANSI X3.12 Subroutine Record Format Standardization
ANSI Y14.5 Dimensioning and Tolerancing for Engineering Drawing
ANSI Y32.1 Logic Diagram Standards
ANSI Y32.16 Electrical and Electrical Reference Designators
ANSI Z210.1 Metric Practice Guide (ASTM 380-72)

7.3 Department of Defense (3)

DoD-STD-100 Engineering Drawings

7.4 Electronic Industries Association (4)

EDIF 4 0 0 Electronic Data Interchange Format

7.5 International Organization for Standards (ISO)

ISO STEP Documentation

AP210	Electronic Printed Circuit Assembly: Drawings and Manufacturing
AP211	Electronic PC Assembly, Test Diagnostics & Remanufacture
AP221	Process Plant Functional Data & Schematic Representation

Appendix A

EXPRESS defines data objects and their relationships among data objects for a domain of interests. Some typical applications of data models include supporting the development of databases and enabling the exchange of data for a particular area of interest. As an example, a specific requirement of a database for an audio compact disc (CD) collection is shown in Figure 1.

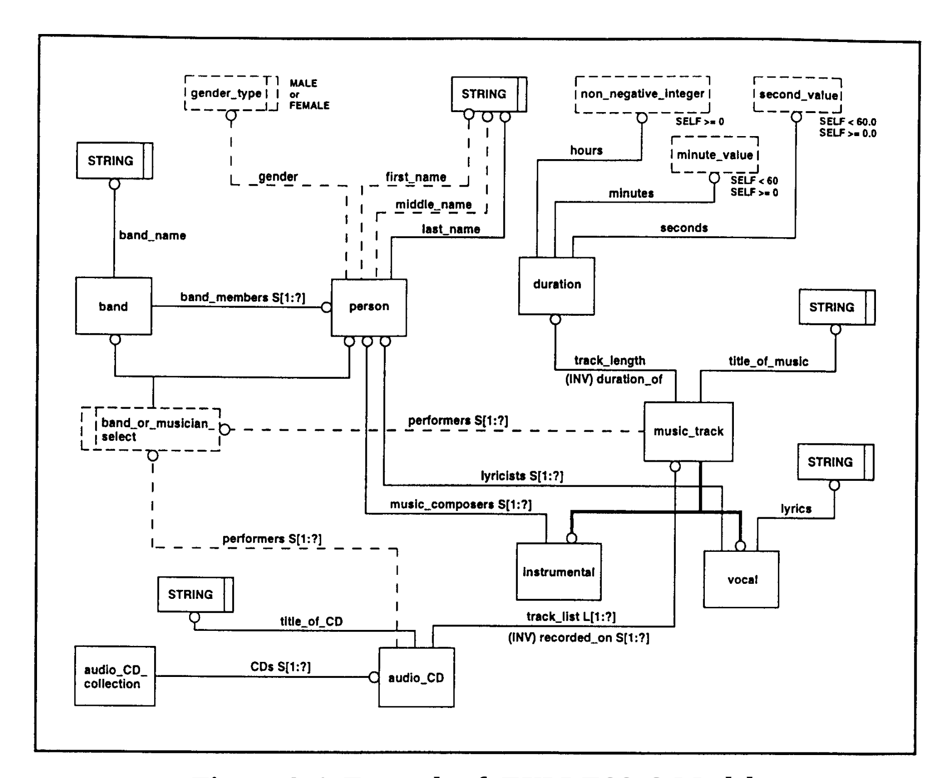


Figure A-1 Example of EXPRESS-G Model

Data models are specified in a data modeling language. EXPRESS is a data modeling language defined in ISO 10303-11. One of the advantages of using EXPRESS-G over EXPRESS is that the structure of a data model can be more intuitively presented. A disadvantage of EXPRESS-G is that complex constraints cannot be formally specified. There are specific symbols used in EXPRESS-G notation. The meaning of those symbols is defined in the EXPRESS formatting.